BREAST CANCER DIAGNOSIS USING NEURO-CBR APPROACH

A project submitted to the Graduate School in partial fulfillment
of the requirements for the degree
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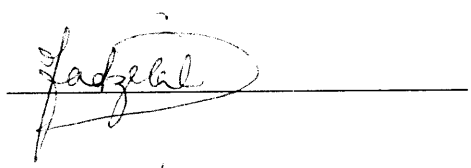
(Signature) : 

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ABSTRAK

Barah payudara merupakan penyebab utama kepada kematian dikalangan wanita. Apabila barah payudara berjaya dikesan, ia boleh diklasifikasikan sebagai 'benign' (tidak mengandungi tisu barah) atau 'malignant' (mengandungi tisu barah). Walaubagaimanapun, sukar untuk membezakan di antara tisu bukan barah daripada tisu barah sehubungan dengan kepelbagaian bentuk barah. Masalah ini menjadi pemangkin kepada para penyelidik untuk mencari kaedah yang lebih baik bagi memperbaiki teknik sedia ada di dalam mengesan barah payudara. Antara teknik yang boleh membantu pakar semasa mendiagnosis barah payudara ialah pengdiagnosan dan pengesanan berbantukan computer (CAD). Alat bantu ini banyak mengaplikasikan teknik kepintaran buatan kerana teknik ini mampu untuk memenuhi keperluan CAD. Oleh itu, terdapat keperluan terhadap beberapa pendekatan di dalam bidang kepintaran buatan untuk melaksanakan CAD. Dalam kajian ini, simulasi rangkaian neural (NN) dengan algoritma rambatan balik telah dibangunkan untuk mengesan keadaan barah payudara pesakit samada ia mengandungi tisu barah atau tidak dan enjin penaakulan berasaskan kes (CBR) dibangunkan untuk mengklasifikasikan peringkat barah dan mencadangkan rawatan yang bersesuaian dengan pesakit. Dalam CBR, 'mono symbolic valued' digunakan bagi mengira persamaan setempat dan teknik 'nearest neighbourhood' diaplikasikan untuk mengira persamaan global. Data barah payudara Wisconsin telah digunakan untuk tujuan latihan dan ujian. Model rangkaian neural memperolehi 98.60 peratus ketepatan. Ini menunjukkan model NN boleh digunakan sebagai alat bantu yang induktif, explorasi dan analitikal di dalam mengesan barah payudara. Dapatan kajian menunjukkan bahawa CBR mampu mengklasifikasikan peringkat barah payudara dengan betul dan memaparkan rawatan yang bersesuaian berdasarkan kepada penilaian oleh doktor. Keputusan daripada kajian ini menunjukkan bahawa gabungan teknologi CBR dan NN mempunyai potensi untuk digunakan dalam domain yang kritikal seperti perubatan. Sistem cadangan ini dibangunkan di dalam platform berasaskan web, supaya ia boleh dicapai pada sebarang masa dan tempat tanpa mengira kedudukan geografi..

ABSTRACT

Breast cancer has become the number one cause of cancer deaths amongst women. Once a breast cancer is detected, it can be classified as benign (not cancerous tissue) or malignant (cancerous tissue). However, it is very difficult to distinguish benign from one that is malignant due to its variability associated with the appearances of the cancer. The problem leads to a motivation for a researcher in finding a technique that can enhance the performance of the previous breast cancer test detections. Among the techniques that could assist a specialist in diagnosing the breast cancer disease is computer-aided detection and diagnosis, abbreviated as CAD. CAD tools have exploited a wide range of AI techniques since these technique are able to support CAD's needs. Hence, there is a need for multiple AI approach to support CAD. In this study, the Neural Network (NN) simulator with backpropagation algorithm was developed to predict the condition of the breast cancer tumor whether it is benign or malignant and Case-Base Reasoning (CBR) engine was developed to classify the cancer stages as well as suggesting appropriate treatment to the patient. In CBR, mono symbolic valued was used to calculate local similarity and nearest neighbourhood was used to calculate global similarity. To evaluate NN accuracy performance, Wisconsin breast cancer data was used for training and testing purposes. NN model obtained 98.60% accuracy classification. This implies that NN model can be used as an inductive, or exploratory, analytical tool for the prediction of the breast cancer tissue. Experimental result also shows that CBR is able to classify the stage correctly and display appropriate treatment planning based on the doctor evaluation. The results from this study indicate that CBR coupled with NN techniques have great potentials to be used for a critical domain like medical. The proposed system is developed in the web-based platform, so that it can be accessed anytime, anywhere regardless of the geographical location.

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CHAPTER 1

INTRODUCTION

This chapter briefly explains the background of the project that mainly involves the integration between neural network and case-based reasoning to form a hybrid intelligent system in order to utilize the advantages from both approaches. The problem statement, objectives, significance of the project and scopes are also presented in this chapter.

1.1 Background Overview

Breast cancer is the most common cancer and has become the number one cause of cancer deaths amongst Malaysian women (National Cancer Registry, 2004). National Cancer Registry reported that 4337 in every 100, 000 women in Malaysia have breast cancer in 2002. Fok *et al.* (2003) indicates that Malaysia has the higher incidence number of breast cancer patient compared to Asian countries like Singapore (39 in every 100,000 women). Thus, a serious action must be taken to decrease the number of patient suffering from the disease. It is believed that the most promising way to overcome the problem is by early detection of cancerous tumor because breast cancer is curable if detected and treated early. (Fok *et al.* (2003), Mashor *et al.* (2002), Wan Zaki *et al.* (2002)). This situation makes the early detection of cancerous tumor becomes critical.

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